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PCT/ZA2003/00132

13 OCT 2006

# Setifikaat

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# Certificate

PATENT OFFICE

DEPARTMENT OF TRADE  
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The attached documents are true copies of the Form P2, P1, P6 and a Provisional Specification of a South African Patent application No. 2002/09262

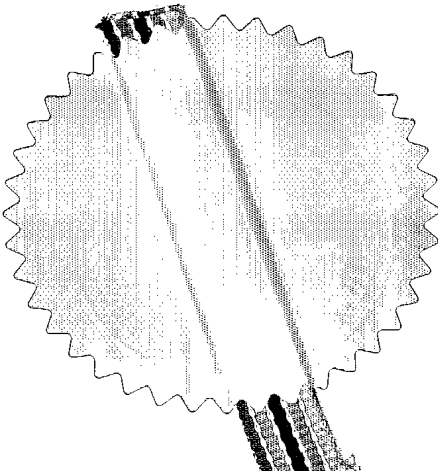
In the name of : **INNOVATIVE MET PRODUCTCTS (PTY) LTD**

Filed on the : **14<sup>th</sup> NOVEMBER 2002**

Entitled : **SEPARATING VESSEL**

Geteken te **PRETORIA** in die Republiek van Suid-Afrika, hierdie **12<sup>th</sup>** dag van **OCTOBER 2006**  
Signed at in the Republic of South Africa, this day of

Registrateur van Patente  
Registrar of Patents



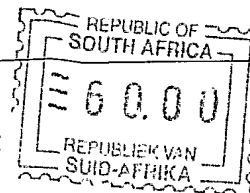
REPUBLIC OF SOUTH AFRICA

PATENTS ACT, 1978

## REGISTER OF PATENTS

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INTERNATIONAL CLASSIFICATION		LODGING DATE : COMPLETE		GRANTED DATE	
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FULL NAME(S) OF APPLICANT(S) / PATENTEE(S)					
71	INNOVATIVE MET PRODUCTS (PTY) LIMITED				
APPLICANTS SUBSTITUTED :				DATE REGISTERED	
71					
ASSIGNEE(S)				DATE REGISTERED	
71					
FULL NAME(S) OF INVENTOR(S)					
72	HOHENSTEIN, Boyne Friedrich				
PRIORITY CLAIMED		COUNTRY		NUMBER	
N.B. Use international abbreviation for country. (See Schedule 4)		33		31	
TITLE OF INVENTION					
54	SEPARATING VESSEL				
ADDRESS OF APPLICANT(S) / PATENTEE(S)					
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ADDRESS FOR SERVICE				REF	
74	D M Kisch Inc, 66 Wierda Road East, Wierda Valley, SANDTON			P25632ZA00	
PATENT OF ADDITION NO.		DATE OF ANY CHANGE			
61					
FRESH APPLICATION BASED ON		DATE OF ANY CHANGE			

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PATENTS ACT, 1978



Form P.1

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT  
(Section 30 (1) - Regulation 22)

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate.

OFFICIAL APPLICATION NO	
21	01 2002/9262

DMK REFERENCE
P25632ZA00

FULL NAME(S) OF APPLICANT(S)

71	INNOVATIVE MET PRODUCTS (PTY) LIMITED
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ADDRESS(ES) OF APPLICANT(S)

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TITLE OF INVENTION

54	SEPARATING VESSEL
	THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANING FORM P2 The earliest priority claimed is
	THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO. 21 01
	THIS APPLICATION IS FRESH APPLICATION IN TERMS OF SECTION 37 AND BASED ON APPLICATION NO. 21 01

THIS APPLICATION IS ACCOMPANIED BY :

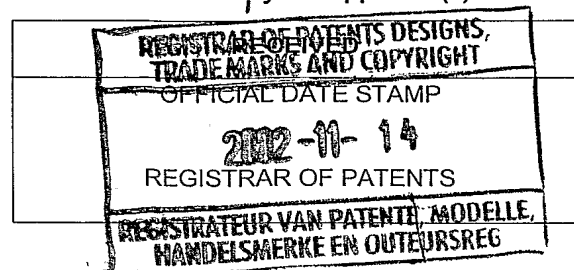
x	1a	A single copy of a provisional specification of 10 pages.		
	1b	Two copies of a complete specification of pages.		
	2a	Informal drawings of sheets.		
x	2b	Formal drawings of 4 sheets.		
	3	Publication particulars and abstract (form P8 in duplicate).		
	4	A copy of figure of the drawings for the abstract.		
	5	Assignment of invention (from the inventors) or other evidence of title.		
	6	Certified priority document(s).		
	7	Translation of priority document(s).		
	8	Assignment of priority rights.		
	9	A copy of form P2 and a specification of S.A. Patent Application.	21	01
	10	A declaration and power of attorney on form P3.		
	11	Request for ante-dating on form P4.		
	12	Request for classification on form P9.		
	13a	Request for delay of acceptance on form P4.		
	13b			

DATED

14 November 2002

ADDRESS FOR SERVICE	
74	D M Kisch Inc 66 Wierda Road East Wierda Valley SANDTON

Patent Attorney for Applicant(s)



The duplicate will be returned to the applicant's address for service as proof of lodging but is not valid unless endorsed with official stamp.

## REPUBLIC OF SOUTH AFRICA

## PATENTS ACT, 1978

PROVISIONAL SPECIFICATION  
( Section 30 (1) - Regulation 27 )

OFFICIAL APPLICATION NO.		LODGING DATE		DMK REFERENCE
21	01/2002/9262	22	14 November 2002	P25632ZA00
FULL NAME(S) OF APPLICANT(S)				
71	INNOVATIVE MET PRODUCTS (PTY) LIMITED			
FULL NAME(S) OF INVENTOR(S)				
72	HOHENSTEIN, Boyne Friedrich			
TITLE OF INVENTION				
54	SEPARATING VESSEL			

## SEPARATING VESSEL

### Field of the Invention

5 THIS invention relates to a separating vessel particularly suitable for, but not limited to, use in mineral sample analysis.

### Background to the Invention

10 In the field of fire assaying, mineral samples are mixed with a flux in a reaction vessel and fused to form a molten flux and molten collector material which collects a metal to be assayed. In conventional fire assay methods, the flux and collector material are caused to solidify and thereafter separated mechanically.

### 15 Object of the Invention

It is accordingly an object of the present invention to provide a novel separating vessel suitable for separating molten slag from a molten collector material in a

mineral sample analysis method such as a fire assay process.

Summary of the Invention

According to the invention a separating vessel suitable for use in a mineral sample  
 5 analysis method wherein a molten slag is separated from a molten collector  
 material, comprises a container defining an interior cavity for receiving the molten  
 materials, an outlet aperture leading from the interior cavity to the exterior of the  
 container, and a separating surface associated with the outlet aperture which is  
 shaped to cause droplets of flux to be carried along such surface, while droplets of  
 10 collector material drip off such surface by the force of gravity.

In a preferred arrangement the separating surface is a downwardly directed concave  
 surface. Such concave surface is preferably concentrically arranged relative to the  
 outlet aperture.

15

Further according to the arrangement, the outlet aperture has dimensions such that  
 the collector material passes through the aperture under the force of gravity, while  
 the molten flux material is substantially prevented from passing through the outlet

aperture.

Thus with the above arrangement, the majority of molten flux will be arrested at the outlet aperture, but a small portion which may pass through the outlet aperture, will be separated from the collector material by the separating surface. This could for

5 example take place where the outlet aperture is gradually enlarged through use.

In a preferred arranged the outlet aperture will be disposed at low level in the interior cavity, and a slag outlet will be provided in the container spaced vertically upwardly from the outlet aperture, the arrangement being one wherein molten slag

10 which overlies the collector material in the molten state will drain from the slag outlet during the process of draining the collector material through the outlet aperture. Molten slag which ultimately remains in the separating vessel after removal of the collector material, can be removed from the vessel for example by tilting or inverting the vessel.

15

Also included separately within the scope of the invention is a method of separating molten collector material from molten slag suitable for a mineral sample analysis process comprising the steps of :



providing the separating vessel of the invention;

5           introducing a mixture of molten slag and molten collector material into the  
vessel whereby the slag settles above the collector material as a result of  
density differentials;

draining the collector material through the outlet aperture under the force of  
10          gravity while the slag is substantially arrested by the outlet aperture;

further separating the collector material from the slag which has passed  
through the outlet aperture at the separating surface where collector material  
runs vertically downwardly from the exit of the outlet aperture under the  
15          force of gravity while the slag is displaced laterally along the separating  
surface.

Further according to the invention the method includes the step of draining slag

through the slag outlet. Preferably, slag will drain through the outlet during or prior to draining the collector material through the outlet aperture.

### **Brief Description of the Drawings**

5

The invention is further described in the preferred embodiment described hereunder purely by way of example with reference to the accompanying drawings wherein:

Figure 1 is a schematic sectioned elevation of a separating vessel in accordance with the invention; and

10

Figures 2 to 4 are schematic sectioned elevations of the separating vessel in Figure 1, illustrating various steps in separating a molten slag from a molten collector material in fire forming part of

15

a fire assay process.

### **Detailed Description of Drawings**

Referring to the drawings, the invention provides a novel separating vessel 10 for separating molten slag 11 from molten collector material 12 for example in a fire assay process.

- 5 The separating vessel 10 comprises a container having an interior receiving zone 13 for the molten materials 11, 12, as shown in Figure 1.

The vessel 10 of the invention further includes a low level outlet aperture 14 which is of a relatively small diameter, and will permit the collector material 12 to drain  
10 through such aperture 14 by gravity, while the molten slag 11 will substantially be prevented from passing through the aperture 14 as a result of the higher viscosity and/or lower density of the molten slag 11.

It is a feature of the invention that a separation surface 15 is provided on the  
15 exterior of the container 10 in the zone of the outlet aperture 14, such separation surface 15 being adapted to separate any molten slag 11a which may trickle through the outlet aperture 14, from the molten collector material 12a, Figure 3 and Figure 4.

In the arrangement illustrated, this separating surface 15 is in the form of a concave surface which is concentrically arranged relative to the axis of the outlet aperture 14. It has been found that with the arrangement of the invention, molten slag droplets 11a tend to cling to the concave surface 15, and are carried laterally away from the outlet aperture 14 ultimately to gather at a rim 15a of the concave surface from which they drop downwardly under the force of gravity, Figure 3. This behaviour of the molten slag droplets 11a can be ascribed to the low density of the slag material 11 and/or its surface tension. The collector material 12a, Figure 3, on the other hand having different physical characteristics in respect of density and surface tension tends to pour directly vertically downwardly from the exit of the outlet aperture 14 under the force of gravity.

In the arrangement illustrated, the molten collector material 12a is collected in a collection vessel 17, while the molten slag drops 11a are transported laterally beyond the collection vessel 17 for separate collection.

A further feature of the invention comprises an intermediate outlet 16 for molten

slag 11 in the side wall of the container 10 in a position spaced vertically upwardly from the outlet aperture 14 for collector material 12. The purpose of this intermediate slag outlet 16 is to drain the majority of molten slag 11 from the separating container while the molten collector material 12 is being drained through  
5 the outlet aperture 14. The relatively small portion of slag 11 which ultimately remains in the separation vessel 10 after draining of the collector material 12 can thus readily be removed from the container 10 by inversion thereof, or tilting thereof, not shown.

10 Thus in use, for example in a fire assay process for determining the concentration of PGM's (Platinum Group Metals) in an ore sample, such ore sample will be comminuted and mixed with a flux material, and introduced into a reaction vessel. The flux will be caused to fuse to produce a molten slag and a molten collector material such as lead, silver, etc, which acts to collect the PGM's. The molten  
15 mixture is then introduced into the separating vessel 10 of the invention in order to separate the molten collector material 12 from the molten slag 11 as described above. In certain cases the separating vessel 10 of the invention could also act as the reaction vessel.

It has been found that with the method described above, sufficient and effective separation of the molten slag 11 and molten collector material 12 can be achieved to enable further analysis of the collector material 12 and entrained PGM's.

5

Doubtless many variations are possible without departing from the principles set out in the consistory clauses. Thus, the separation surface 15 could for example merely comprise a surface which is angled to the vertical in a single plane or in several planes whereby molten slag drops 11a are carried transversely away from outlet duct 14 for separate collection. Alternatively, the separation surface 15 could be  
10 could be conical.

Dated this 14 day of November 2002

Patent Attorney, Agent for the Applicant

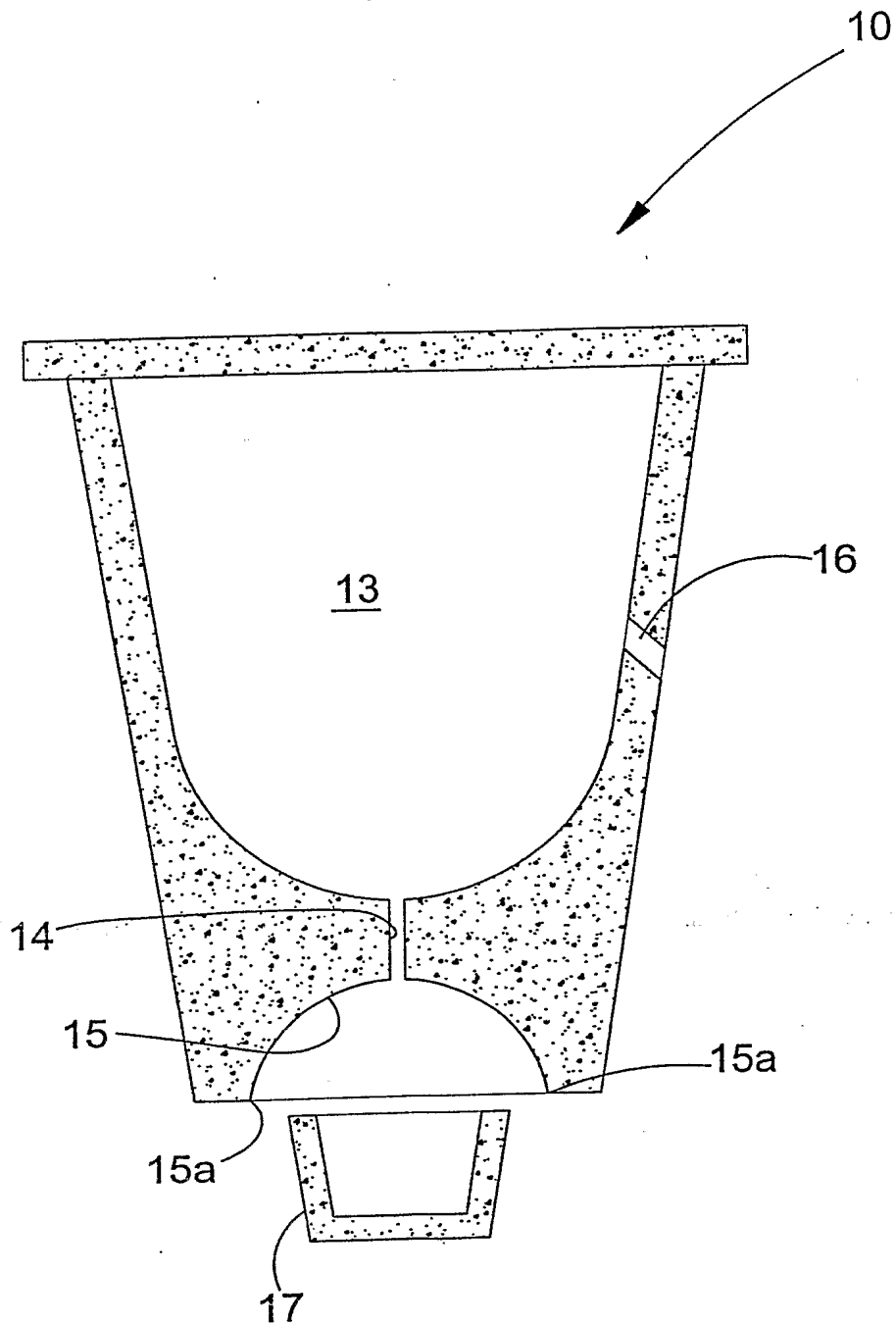


FIGURE 1

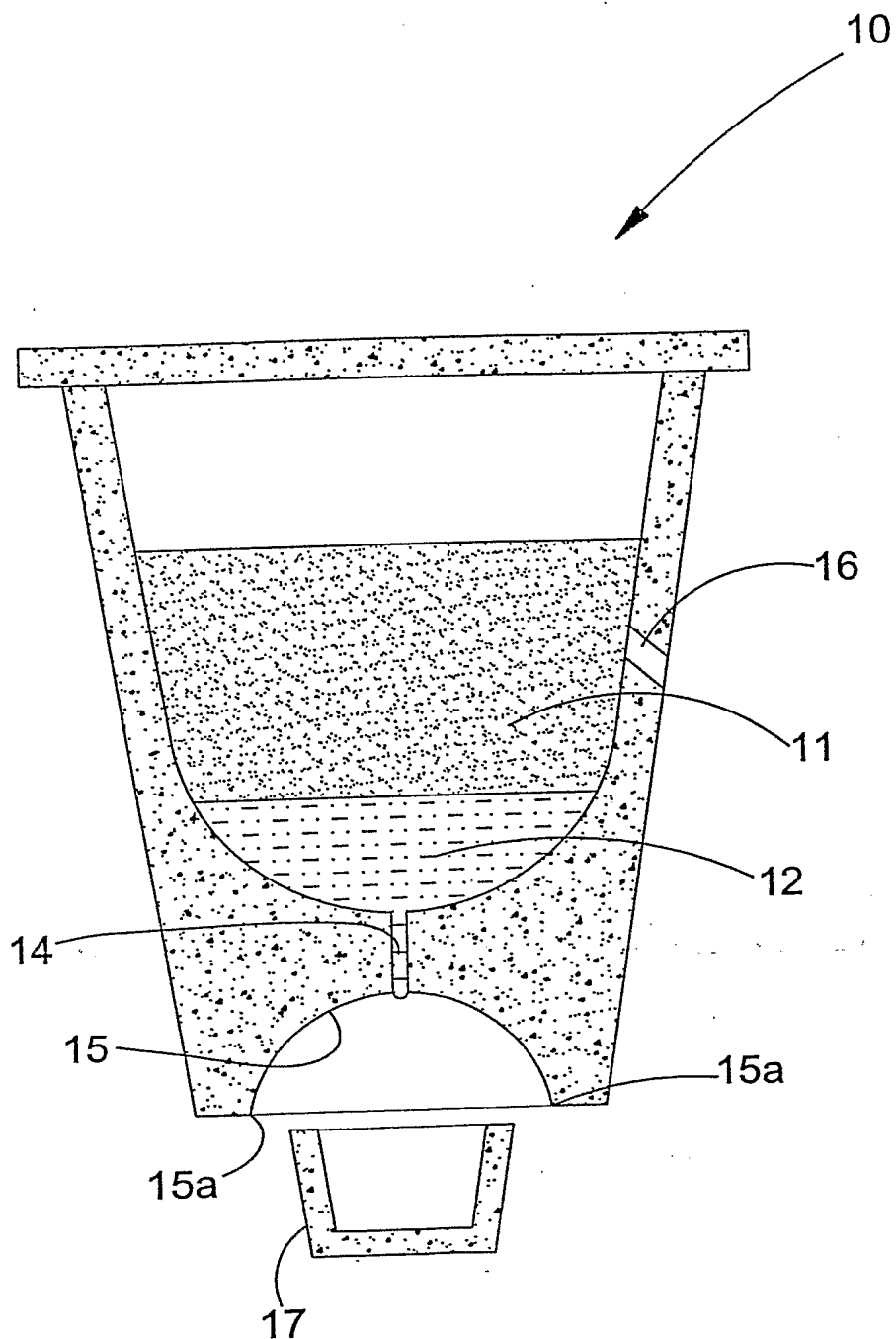


FIGURE 2



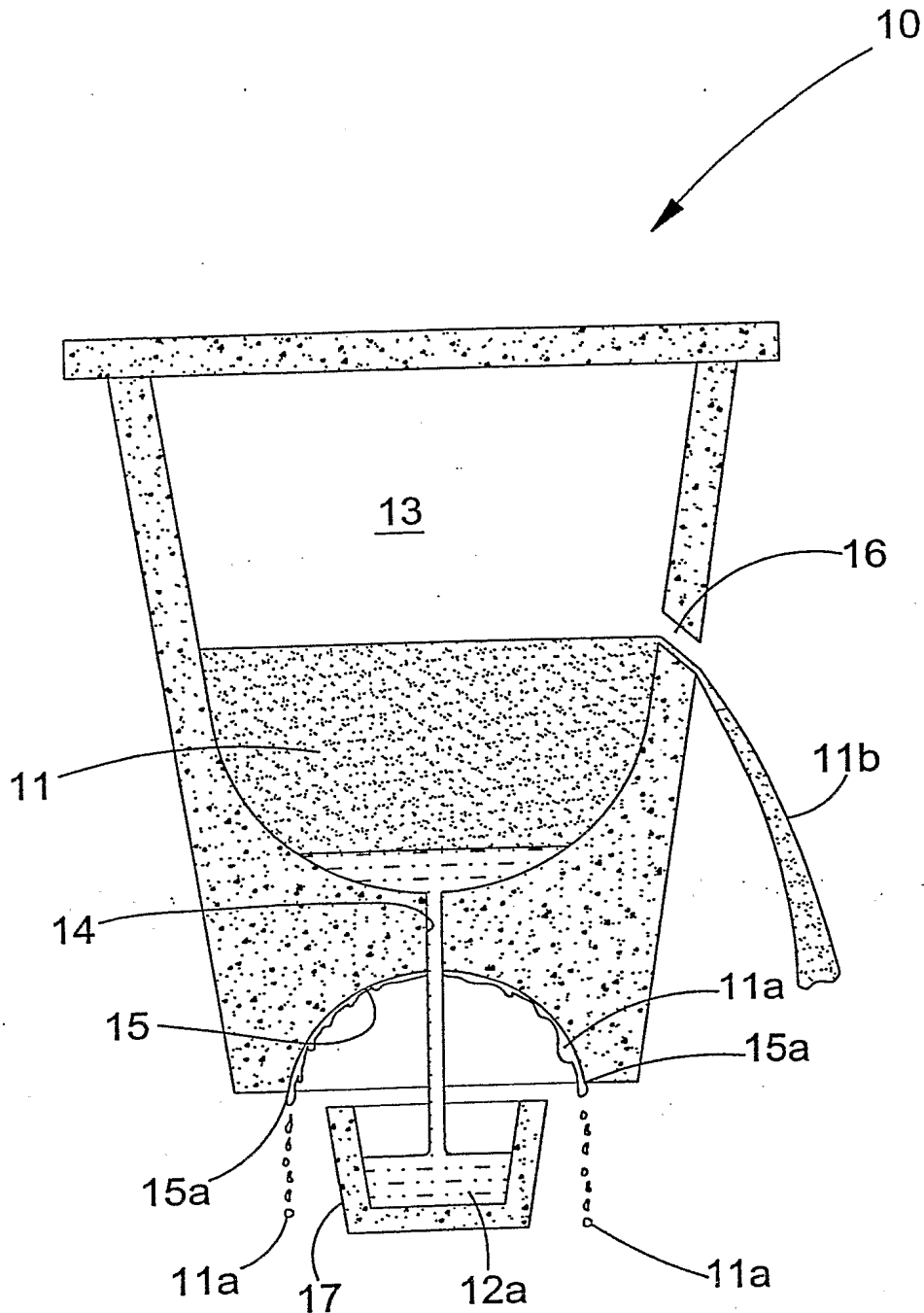


FIGURE 3

